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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/686,115      | 10/11/2000  | Charu C. Aggarwal    | YOR920000429US1     | 4940             |

7590 09/30/2003  
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EXAMINER

BOOKER, KELVIN E

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2121

DATE MAILED: 09/30/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/686,115

Applicant(s)

AGGARWAL ET AL.

Examiner

Kelvin E Booker

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-13, 16-23 and 26-30 is/are rejected.
- 7) ☒ Claim(s) 4, 5, 14, 15, 24 and 25 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: *Detailed Office Action*.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. **Claims 1-3, 6-9, 11-13, 16-19, 21-23 and 26-29** are rejected under 35 U.S.C. 102(a) as being anticipated by Knorr et al., “Distance-Based Outliers: Algorithms and Applications” [hereafter Knorr].

**As per claim 1**, Knorr teaches of a method of detecting one or more outliers in a data set, comprising the steps of:

A. determining one or more sets of dimensions and corresponding ranges in the data set which are sparse in density (see the *Abstract*; and section 3.1: *Index-based algorithms*, especially paragraphs one and two: “Let N be...as an outlier”); and

B. determining one or more data points in the data set which contain these sets of dimensions and corresponding ranges, the one or more data points being identified as the one or more outliers in the data set (see section 3.1: *Index-based algorithms*, especially paragraph two: “From the formulation...as an outlier”).

**As per claim 2**, Knorr teaches of a method wherein a range is defined as a set of contiguous values on a given dimension (see section 3.1: *Index-based algorithms*, especially

paragraphs one and two; and section 4.4: *Generalization to higher dimensions*, especially paragraph one: “When moving from...Properties 1 and 2”).

**As per claim 3**, Knorr teaches of a method wherein the sets of dimensions and corresponding ranges in which the data is sparse in density is quantified by a sparsity coefficient measure (see section 4.4: *Generalization to higher dimensions*, especially paragraph two: “However to preserve...kD cell structure”).

**As per claim 6**, Knorr teaches of a method wherein a set of dimensions is determined using an algorithm which uses the processes of solution recombination, selection and mutation over a population of multiple solutions (see section 3.1: *Index-based algorithms*, especially paragraph three: determining outliers with regards to multiple dimensions).

**As per claim 7**, Knorr teaches of a method wherein the process of solution recombination comprises combining characteristics of two solutions in order to create two new solutions (see section 3.2: *A nested-loop algorithm*, especially paragraph one: “To avoid the cost...D-neighbors exceeds M”).

**As per claim 8**, Knorr teaches of a method wherein the process of mutation comprises changing a particular characteristic of a solution in order to result in a new solution (see 4.4: *Generalization to higher dimensions*, especially paragraph two: “However to preserve...kD cell structure”).

**As per claim 9**, Knorr teaches of a method wherein the process of selection comprises biasing the population in order to favor solutions which are more optimum (see 4.4: *Generalization to higher dimensions*, especially paragraph two: “However to preserve...kD cell structure”).

**As per claims 11-13 and 16-19**, the same limitations are subjected to in claims 1-3 and 6-10, respectively, therefore the same rejections apply (see claims 1-3 and 6-10 above).

**As per claims 21-23 and 26-29**, the same limitations are subjected to in claims 1-3 and 6-10, respectively, therefore the same rejections apply (see claims 1-3 and 6-10 above).

3. **Claims 10, 20 and 30** are rejected under 35 U.S.C. 102(a) as being anticipated by Sheikholeslami et al., “WaveCluster: a wavelet-based clustering approach for spatial data in very large databases” [hereafter Sheikholeslami].

**As per claim 10**, Sheikholeslami teaches of a method of detecting one or more outliers in a data set, comprising the steps of:

A. identifying and mining one or more patterns in the data set which have abnormally low presence not due to randomness (see section 1: *Introduction*, especially page 289, paragraph three: “The aim of data-clustering...during the mining process); and

B. identifying one or more records which have the one or more patterns present in them as the one or more outliers (see section 6: Performance Evaluation, especially page 299, section *Handling noise objects*: “WaveClustering is very effective...the one without noise”).

**As per claims 20 and 30**, the same limitations are subjected to in claim 10, therefore the same rejections apply (see claim 10 above).

***Allowable Subject Matter***

4. **Claims 4, 5, 14, 15, 24 and 25** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The following is a statement of reasons for the indication of allowable subject matter:

the cited prior art fails to explicitly teach of a method and means for detecting one or more outliers in a data set inclusive of the limitations of claims 1 and 3 [respective of claims 4 and 5 above], claims 11 and 13 [respective of claims 14 and 15 above] and claims 21 and 23 [respective of claims 24 and 25 above] consistent with the limitations of the aforementioned claims 4, 5, 14, 15, 24 and 25, wherein the sparsity coefficient measure (S(D)) is defined as  $[(n(D)-(N*f^k))/(N*f^k*(1-f^k))^{1/2}]$ , whereby S(D) is inversely proportional to the number of data points in a given set of dimensions and corresponding ranges.

***Conclusion***

6. The following is prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- A. Lodder, U.S. Patent No. 5,121,338;
- B. Bickel, U.S. Patent No. 5,263,120;
- C. Zhang et al., U.S. Patent No. 5,832,182;
- D. Zhang et al., U.S. Patent Application Publication No. 2002/0165837;
- E. Agrawal et al., U.S. Patent No. 6,003,029;

- F. Guha et al., U.S. Patent No. 6,092,072;
- G. Fayyad et al., U.S. Patent No. 6,115,708;
- H. Nguyen et al., U.S. Patent No. 6,336,082;
- I. Agrafiotis et al., U.S. Patent No. 6,571,227;
- J. Guha et al., "CURE: An Efficient Clustering Algorithm for Large Databases";
- K. Knorr et al., "A Unified Approach for Mining Outliers";
- L. Becker et al., "The Maximum Asymptotic Bias of Outlier Identifiers";
- M. Srikant et al., "Research Report: Mining Sequential Patterns: Generalizations and Performance Improvements";
- N. Nasraoui et al., "A Robust Estimator Based on Density and Scale Optimization and its Application to Clustering";
- O. Maiyuran et al., "A Cluster Based Approach to Robust Regression and Outlier Detection".
- P. Shanmugasundaram et al., "Compressed Data Cubes for OLAP Aggregate Query Approximation on Continuous Dimensions";
- Q. Palpanas, T., "Knowledge Discovery in Data Warehouses";
- R. Kunz et al., "Fast Detection of Communication Patterns in Distributed Executions";
- S. Aggarwal et al., "On the Merits of Building Categorization Systems by Supervised Clustering"; and
- T. Jain et al., "Data Clustering: A Review".

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7. An inquiry concerning this communication or earlier communications from the examiner should be directed to Kelvin Booker whose telephone number is (703) 308-4088. The examiner can normally be reached on Monday-Friday from 7:00 AM-5:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anil Khatri, can be reached on (703) 305-0282. The fax number for the organization where this application or proceeding is assigned is (703) 746-7239.

An inquiry of a general nature or relating to the status of this application proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

**K.E.B.**

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**September 11, 2003**



**Wilbert L. Starks, Jr.  
Primary Examiner  
Art Unit - 2121**